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Investigation of the unbound 21C nucleus via transfer reaction

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Interpretation of the properties of unbound nuclei is one of the most important subjects in nuclear physics. In this paper we focus on 21C formed by the transfer reaction 20C(d,p)21C. In this reaction 21C (the n+20C system in fact) with various energy states, which can be the d3/2 resonance or nonresonant continuum states, are populated by the neutron transfer to 20C.

We describe the coupling between those states by using the continuum-discretized coupled-channels method (CDCC). CDCC is a powerful reaction model which can treat explicitly the coupling between bound states and continuum states including resonances. It is well known that the transition matrix of a transfer process populating an unbound nucleus diverges. In this study, we circumvent this problem by choosing carefully the transition interaction for the transfer reaction.

The purpose of this study is to investigate how the coupling between resonant and nonresonant states is strong, and see its effects on the transfer cross section. This cross section brings the energy spectrum of the n-20C system, which will reveal the "figure" of 21C formed by the 20C(d,p) reaction.

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