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The study of resonant states in ^{12}C via ^{12}C + nucleon scattering

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In carbon isotopes, the cluster structure is developed and some excited resonant states regarded as gaslike state of α particles appears. For example, the resonant state called the Hoyle state in ^{12}C is important in the process of the nucleosynthesis. It is very important to study the excited states in ^{12}C including the Hoyle state, especially resonant states. In the previous works, there are many experiments to probe those states. However, not only resonant states, but also non-resonant states are included in the data from the experiments, so we need to get only information of resonant states.

In our study, we analyze ^{12}C + nucleon scattering to understand the effects of the resonant and non- resonant states in ^{12}C. We adapt the complex scaling method (CSM) for the description of the resonant states, and calculate the cross sections with the four-body CDCC method. In the CDCC calculation, we use the JLM potential, which is the optical-model potential and we consider the $0^+, 1^-,$ and 2^+ states of ^{12}C.

In this conference, we report the results of the breakup cross sections, and discuss the effects of the resonant and non-resonant states in ^{12}C.

Primary authors: YAMADA, Yushin (Kyushu University); Dr MATSUMOTO, Takuma (Kyushu University)

Presenter: YAMADA, Yushin (Kyushu University)

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