PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
Special Heavy Ion Discussion Group

Sunji Kim

Seoul National University, South Korea

Invariant Mass Spectroscopy of ^{17}C Using the SAMURAI Spectrometer

Neutron-rich carbon isotopes have attracted attention in recent years due to their anomalous level structures. From the migration of the 2_1^+ states, the collapse of the $N = 14$ shell gap was found while the shell gap clearly emerges in oxygen isotopes [1]. It indicates the near degeneracy of the $s_{1/2}$ and $d_{5/2}$ orbits and different strength of the proton-neutron interaction in carbon isotopes from that in oxygen isotopes. Another striking property of neutron-rich carbon isotopes is compression of 2_1^+ energies in ^{18,20}C compared with the shell model calculations in the conventional WBT and WBP interactions. In order to describe the measured 2_1^+ energies, the reduction of the neutron-neutron interaction in *sd* orbits has been proposed in the calculations empirically [1,2]. However, detailed mechanisms and interplay of nucleons remain to be answered.

To furnish information on energy levels and understand the behavior of *p-sd* orbits, we performed a spectroscopic study of unbound excited states in ^{17}C. The experiment was performed by using the SAMURAI spectrometer [3] at RIBF of RIKEN. Unbound states of ^{17}C were populated via one-neutron knockout of ^{18}C, and the excitation energies of them were obtained by the momentum vectors of the ^{16}C fragments and neutrons in invariant mass method with γ-ray energies emitted from ^{16}C. In the present work, four unbound states of ^{17}C were observed. To verify their spin-parities, angular momenta of the states were determined by comparison of the momentum distributions between the measurement and calculation, and then the spin-parities were assigned by the shell model calculations with a new effective interaction based on a monopole based universal interaction [4]. In the presentation, the detailed analysis and results with interpretation will be shown.

[1] M. Stanoiu *et al*., Phys. Rev. C **78**, 034315 (2008).
[2] C. M. Campbell *et al*., Phys. Rev. Lett. **97**, 112501 (2006).
[3] T. Kobayashi *et al*., Nucl. Instrum. Methods Phys. Res., Sect. B **317**, 294 (2013).
[4] T. Otsuka *et al*., Phys. Rev. Lett. **104**, 012501 (2010).

Thursday, October 27, 2016
11:00 a.m.
Building 203 Auditorium

Please note different day, time, and location