Contribution ID: **61** Type: **Oral**

Shape evolution and Collectivity beyond 78Ni: Lifetime measurements of low-lying states in neutron-rich Zn

Tuesday, 18 July 2023 16:25 (15 minutes)

Nuclear shape is a sensitive probe of understanding the many-body quantum system and nucleon-nucleon interaction. Shape coexistence was reported in doubly magic 78Ni [1]. Related features such as triaxiality [2] and onset of deformation beyond N = 50 [3,4] were also reported in this mass region. The study of these phenomena plays a crucial role in understanding the limit of nuclear stability as well as the predicted fifth island of inversion [5]. One of the observables experimentally to study nuclear shape is the lifetime of excitation state, which has a direct link with the electric quadrupole moment Q. In a recent gamma spectroscopy study of 82,84Zn [4], the magicity was confined to N = 50 in 80Zn only, while an onset of deformation for low-lying states was identified with the help of E(2+) and E(41+)/ E(21+) ratios towards heavier Zn isotopes. However, the lifetimes of these states are still unknown. Therefore, lifetime measurement of low-lying states was performed in neutron-rich Zn isotopes to further investigate the shape evolution and development of collectivity beyond N = 50.

Neutron-rich Zn isotopes were investigated at RIKEN Nishina Center during the HiCARI 2020 campaign. 345 MeV/u 238U impinged on 9Be primary target with an average intensity 60 pnA. Production fragments were then separated and identified by BigRIPS spectrometer. A secondary 6 mm thick 9Be target was placed at F8 to induce knockout reactions. After the target, ion of interests were identified on an event-by-event base by using Bρ-ΔE-TOF technique with the ZeroDegree spectrometer. The secondary target was surrounded by HiCARI, consisting of 6 Miniball triple clusters, 4 Clovers and 2 Gretina-type tracking clusters, which was used for Doppler correction of gamma rays from in-flight ions and lifetime measurement.

Some low-lying states in neutron-rich 76-82Zn were established based on the recent experiment. The lifetime of each state was determined by gamma-ray lineshape analysis [6]. The shape evolution in neutron-rich Zn isotopes will be discussed by comparing the experimental results with shell model and mean-field calculations.
[1] R. Taniuchi et al., Nature 569, 53 (2019).
[2] A. M. Forney et al., PRL 120, 212501 (2018).
[3] C. Delafosse et al., PRL 121, 192502 (2018).
[4] C. Shand et al., PLB 773, 492 (2017).
[5] F. Nowacki et al., PRL 117, 272501 (2016).
[6] P. Doornenbal et al., NIMA 613, 218 (2010).

Primary authors: Dr CHEN, Zhiqiang (GSI); Prof. PODOLYÁK, Zsolt (University of Surrey); Prof. FLAVIGNY, Freddy (LPC Caen); Dr GÓRSKA-OTT, Magdalena (GSI); COLLABORATION, RIBF196

Presenter: Dr CHEN, Zhiqiang (GSI)

Session Classification: Session 7A

Track Classification: Experimental Nuclear Structure