Contribution ID: **10** Type: **not specified**

Exotic Decays and Reactions of Extremely Proton-rich Nuclei

Friday, 11 October 2019 10:50 (20 minutes)

With the development of radioactive ion beams (RIBs), reaction and decay studies with exotic nuclei become a hot topic in nuclear physics. In the talk, I would like to mention some recent progresses achieved by our group, mainly on the following two topics: 1) Exotic decays of extremely proton-rich nuclei. Beta-delayed particle decays from 20,21Mg, 22,23Al, 22,23,24Si, 26,27P, 27,28,29S have been measured by the continuous implantation-decay method using silicon arrays and γ-detectors. A lot of new decays have been observed and rich information of β-decay spectroscopy has been obtained. For example, a new βp-decay branch was observed for 20Mg and the 22Si nucleus is identified as new β2p emitter [1]. Moreover, the p and γ emissions from the excited state (1120 keV, 3/2+) of 27P were measured simultaneously in 27S β-decays [2], which is useful to determine the astrophysical reaction rate of 26Si(p,γ)27P and study the nucleosynthesis of 26Al in the Milky Way. 2)Reactions with exotic nuclei. Nucleus-nucleus interaction potential is a start-point to understand the gross feature of nuclear reaction. Due to the limitation of intensity and quality of RIB, it is rather difficult to extract the optical model potentials (OMPs) of exotic nuclear systems by the traditional method of elastic scattering. For this reason, a transfer reaction method was proposed and applied to extract the OMPs of 6He+12C, 64Zn, 209Bi systems via 11B, 63Cu, 208Pb(7Li,6He) reactions [3]. The threshold anomaly behavior has been obtained in the 6He+209Bi system for the first time, showing that the dispersion relation is not applicable for the exotic nuclear systems. Moreover, special processes involving the weakly-bound nature are crucial to understand the reaction mechanism of exotic nuclei. An important task is to understand the breakup effects as well as its mechanism. To this end, a complete-kinematics measurement method was developed and applied in the 17F+58Ni, 89Y, 208Pb and 7Be+208Pb experiments [4]. The processes of elastic scattering, breakup/transfer, and fusion evaporation have been identified successfully. Preliminary results of 17F+58Ni show that the fusion is suppressed at above-barrier energies due to the loss of incident flux while enhanced below-barrier due to couplings to the continuum states. Details will be presented in the conference.

[1] X.X. Xu, C.J. Lin, L.J. Sun et al., Phys. Lett. B 766, 312 (2017); Phys. Rev. C 95, 014314 (2017).
[2] L.J. Sun, X.X. Xu, C.J. Lin et al., Phys. Rev. C 99, 064312 (2019).
[3] L. Yang, C. J. Lin, H. M. Jia et al, Phys. Rev. Lett. 119, 042503 (2017); Phys. Rev. C 96, 044615 (2017); Phys. Rev. C 95, 034616 (2017)
[4] G. L. Zhang, G. X. Zhang, C. J. Lin et al., Phys. Rev. C 97, 044618 (2018).

Abstract Type

Talk

Primary author: Prof. LIN, Chengjian (China Institute of Atomic Energy)

Presenter: Prof. LIN, Chengjian (China Institute of Atomic Energy)

Session Classification: S2: 核反应、核天体物理

Track Classification: 核反应、核天体物理