HAW05-2005-000461

Abstract for an Invited Paper for the HAW05 Meeting of the American Physical Society

## Properties of Excited States in Exotic Nuclei Probed by Direct Reactions SUSUMU SHIMOURA, CNS, University of Tokyo

Direct reactions have been commonly used to populate excited states having characteristic quantum numbers depending on the probes such as proton, deuteron, alpha, Coulomb field, and so on. In RI-beam experiments, these probes are prepared as experimental target and excited states of beam or beam-like nucleus are identified by measuring all the decay products including  $\gamma$ -rays where the invariant masses are reconstructed to determine the excitation energies. It is noted that the Doppler-shift correction of the  $\gamma$ -ray from the moving nucleus is equivalent to reconstruct the invariant mass of the  $\gamma$  and the residual nucleus. The combination of the inverse kinematics and the invariant mass spectroscopy has several advantages to overcome poor energy resolutions, weak intensities and a poor purity of RI beams. One of the advantages in an experimental point of view is that physical probe can be changed by replacing the experimental target without changing the configuration of the detector system. Another advantage is that spectroscopy of an exotic nucleus via different reaction processes such as inelastic scatterings, stripping and knockout reactions from different nuclei in an RI beam at the same time. Those facts provide us characteristics of excited states by directly comparing excitation spectra from different reactions and/or probes with the same acceptance. I present some of the recent experimental results on properties of exotic nuclei by using the above-mentioned techniques.