Contribution ID: **2** Type: **not specified**

Cluster structure of neutron-rich Beryllium isotopes investigated by cluster quasi-free scattering reaction

Saturday, 31 August 2019 16:10 (20 minutes)

Alpha clustering is the key cornerstone for the complete understanding of the structure of nuclei and fundamental nuclear interactions. So far alpha-particle clustering has dominated cluster states studies among all other possible partitioning. While it is known for long as an important feature of stable N=Z nuclei [1], its existence in exotic nuclei with large imbalance of proton and neutron number is still a question. Neutron-excess Beryllium isotopes 10Be,12Be,14Be are the very appealing candidates of clustering studies as being built on the well-developed alpha-alpha rotor of 8Be (N=4, Z=4). It is predicted by the recent antisymmetrized molecular dynamics model (AMD) that strong degree of alpha clustering in the ground-state remain high from 10Be up to the dripline 14Be [2].

The SAMURAI12 experiment performed at Radioactive Isotope Beam Factory (RIBF) in RIKEN aims to investigate the cluster structure of neutron-rich beryllium isotopes using the cluster quasifree scattering reaction (p,pa) in inverse kinematics. The reactions of interest were induced by beams of 10,12,14Be isotopes at 150MeV/u impinging on a pure large diameter 2 mm thick solid hydrogen target. The detection of Helium residues was performed by using the SAMURAI spectrometer and its standard detectors. ESPRI Recoil Proton Spectrometer (RPS) was implemented for recoil proton detection, covering an angular range of 50°-70°. For detection of alpha clusters, two telescopes composed of Silicon and CsI(Tl) detectors was placed at forward angles to cover the angular range 4°-12°. Their cross sections and momentum distributions allow us to probe the alpha cluster structures directly and quantitatively. In this talk, the status of data analysis will be presented.

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Session Classification: Status report