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Giant resonances in Tin-region unstable nuclei

The equation of state (EoS) of nuclear matter not only governs the femto-scale quantum many-body system, namely nuclei, but also plays an important role in the structure of neutron stars and in supernova phenomena. In particular, the EoS of isospin asymmetric nuclear matter attracts much interest from the viewpoint of the existence of heavy neutron stars. The asymmetric term of incompressibility, K_τ, can be a benchmark for various EoSs because it can be directly deduced from the the energies of the isoscalar giant monopole resonance (ISGMR) measured along an isotopic chain, such as tin isotopes, or isobaric chain. The present value of K_τ is -550$\pm$100~MeV and its error is relatively larger than those of other parameters of the EoS. In order to improve the K_τ value, the measurement on the isotopic chain should be extended to unstable nuclei. A doubly magic tin isotope, ^{132}Sn, has been chosen as a flagship for the measurements of unstable tin isotopes because of its large isospin asymmetry and double magic nature.

The measurement of deuterium inelastic scattering off ^{132}Sn was performed at RIBF in RIKEN. The secondary beam of ^{132}Sn was produced from ^{238}U primary beam and it impinged on an active target system CAT-S based on a time projection chamber with silicon detectors. The CAT-S is filled with 0.4-atm deuterium gas, which is detector gas and target simultaneously. The excitation energy and scattering angle in center-of-mass frame is obtained from the four momentum of beam measured by beam line detector system and the one of recoil measured by CAT-S.

In this paper, I will discuss the giant resonances in ^{132}Sn and its neighboring nuclei together with the current status of systematic measurement of giant resonance in unstable nuclei around ^{132}Sn.

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