Contribution ID: **36** Type: **Experimental Nuclear Physics**

ISGMR measurement in Kr isotope with CAT-M

Tuesday, 23 August 2022 14:15 (15 minutes)

The incompressibility in nuclear matter (K_0 and K_τ) play an important role in clarifying the equation of state (EOS) of nuclear matter in extreme environments such as neutron stars.
K_0 and K_τ can be directly determined from the nuclear incompressibility K_A measured from isoscalar giant monopole resonance (ISGMR) measurements. K_A can be expressed as follows from the nuclear droplet model, $K_A = K_0 + K_s A^{-1/3} + \left(K_\tau + K_{\tau s} A^{-1/3}\right) \alpha^2 + K_C Z^2 A^{-4/3}$.
K_s and $K_{\tau s}$ are surface terms and K_C is the Coulomb term; K_C can be assumed to be known because the model error is very small.
In previous studies, measurements of ^{90}Zr, ^{208}Pb, Sn and Cd isotopes, which are double magic nuclei, have shown that $K_0 = 240 \pm 20$ MeV and $K_\tau = -550 \pm 100$ MeV, and The error of K_τ is as large as 20\%. Also a recent study with $A \sim 90$ reported $K_0 = 202$ MeV, which is a significant deviation from existing measurements.

The reason is that the surface effects (K_s and $K_{\tau s}$) cannot be evaluated.
Therefore, it is important to perform systematic ISGMR measurements with various nuclei, including unstable nuclei, and to quantitatively evaluate the surface effects specific to each nucleus.
The ISGMR measurement in unstable nuclei requires the measurement of low-energy recoil particles that are scattered forward angle using the RI beam.
On the other hand, there is a trade-off relation between target thickness and measurable range.
Therefore, a gas active target is best suited for systematic measurements.

We have developed an active target for systematic measurement of ISGMR, CAT-M, which consists of a small TPC for beam particle measurement (Beam TPC), a TPC for recoil particle measurement (Recoil TPC), and a dipole magnet for δ-ray removal associated with heavy-ion beam irradiation.
In this study, as a systematic measurement using Kr isotopes, we performed ISGMR measurements using ^{86}Kr and ^{80}Kr (d, d') reactions.
In this presentation, we report the details of the experiments and the performance of CAT-M.

Primary author: ENDO, Fumitaka (Tohoku Univ)

Presenter: ENDO, Fumitaka (Tohoku Univ)

Session Classification: Young Scientist Session 3