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# Study of isoscalar giant resonances in exotic nuclei by means of inverse reactions

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For the MAYA and EXL collaborations

Isoscalar giant resonances in exotic nuclei can be studied using inelastic alpha scattering in inverse kinematics. In particular, the compression modes, i.e. isoscalar giant monopole (ISGMR) and dipole (ISGDR) resonances are very interesting because they can furnish information on the different terms of the nuclear incompressibility, especially if measured in long isotopic chains including nuclei far from the valley of stability. As beams of exotic nuclei have relatively low intensities thick targets have to be used in order to get a reasonable yield. However, this leads to degradation of the energy resolution and stops low-energy recoil particles. Two good alternatives exist. The first method is to use an active target, such as MAYA, which is a time-projection chamber and therefore can be used for detection of low-energy recoil particles. Furthermore, its thickness can be increased by increasing the length of the detection volume or the gas pressure without severe loss of energy resolution. The second method is to use a storage ring for storing the exotic nuclei, which then interact with target nuclei from a gas-jet target. Here, the luminosity and hence the yield are increased because the exotic nuclei circulate in the ring at a frequency of around 106 turns/s. Low-energy recoil particles traverse the gas-jet with little loss of energy and can be detected in solid-state detectors.

Pioneering experiments with both methods have been performed for inelastic scattering of secondary 56Ni beam off helium nuclei, which occurs inside the detector volume in the case of MAYA and with the gas jet in the case of the experimental storage ring (ESR) at GSI. In the case of MAYA experiment, the tracks of the recoil alpha particles have been measured in the detector volume yielding their scattering angles, ranges and therefore energies. Using forward-angle Si/CsI telescopes, the decay protons and alpha particles from the giant resonance region in 56Ni, have also been measured in coincidence with recoil alpha particles in MAYA. Results from both experiments will be presented.

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